2011

Supply Shock: The Case Of Argentina And Export Taxes

Jashaun Antoni Carter

North Carolina Agricultural & Technical State University

SUPPLY SHOCK: THE CASE OF ARGENTINA AND EXPORT TAXES

by

Jashaun Antoni Carter

A thesis submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of
MASTER OF SCIENCE

Department: Agricultural Economics and Rural Sociology
Major: Agricultural Economics
Major Professor: Dr. Kenrett Jefferson-Moore

North Carolina A&T State University
Greensboro, North Carolina
2011

School of Graduate Studies
North Carolina Agricultural and Technical State University

This is to certify that the thesis requirements of

Jashaun Antoni Carter

has met the thesis requirements of
North Carolina Agricultural and Technical State University

Greensboro, North Carolina
2011

Approved by:

Dr. Kenrett Jefferson Moore Major Professor	Dr. Osei Yeboah Committee Member
Dr. Kofi Adu-nyako Committee Member	Dr. Anthony Yeboah Department Chairperson

Sanjiv Sarin
Dean of Graduate Studies

BIOGRAPHICAL SKETCH

As a native of North Carolina, Jashaun Antoni Carter received a bachelor of science in business management from North Carolina Agricultural and Technical State University with cum laude distinction. During his undergraduate tenure, Jashaun Antoni Carter interned Carrier Corporation and Cargill Corporation. Also, Jashaun Antoni Carter was involved in Youth Taking Charge, Student of Automotive Engineering, and the Resident Hall Association. After completing his undergraduate degree, Jashaun Antoni Carter completed a master's degree in Agricultural Economics from North Carolina Agricultural and Technical State University.

TABLE OF CONTENTS

LIST OF FIGURES

FIGURES **PAGE**

LIST OF TABLES

TABLES **PAGE**

LIST OF ABBREVIATIONS

BOT	Balance of Trade
CS	Consumer Surplus
e*	Exchange Rate
FAO	Food and Agriculture Organization of the United Nations
GOA	Government of Argentina
GDP	Gross Domestic Product
GE	General Equilibrium
H_a	Alternative Hypothesis
H_o	Null Hypothesis
ISI	Import Substitution Industrialization
MMT	Million Metric Tons
NASS	National Agricultural Statistical Service
OPEC	Organization of Petroleum Exporting Countries
P_o	Market equilibrium price
Pcorn	Market price of corn
PE	Partial Equilibrium

P_m	Market price of imports
PS	Producer Surplus
Psoy	Market price of soybeans
PWT	Penn World Tables
P_x	Market price of exports
Q_m	Quantity of imports
Q_x	Quantity of exports
Rgdp	Real Gross Domestic Product
ROW	Rest of the World
α	Alpha
Δ	Change
ε	Elasticity
δ	Gamma
λ	Lambda
∂	Partial Derivative

ABSTRACT

Carter, Jashaun Antoni. SUPPLY SHOCK: THE CASE OF ARGENTINA AND EXPORT TAXES. **(Major Advisor: Dr. Kenrett Jefferson-Moore).** North Carolina Agricultural and Technical State University

Because of Argentina's drastic change in its' domestic export tax rate, there was a shortage of soybean supply in the global market and global soybean prices were inflated. Simultaneous equations are used to develop supply and demand equations for the global soybean market. The variables used in the simultaneous equations to help explain global quantity supplied and demanded for soybeans are: the price of soybeans (Psoy), the price of corn (Pcorn), export taxes (Tax), the technology (Tech), a dummy variable (novice), and real gross domestic product (Rgdp). The outcome of the simultaneous equations estimates that there is an inverse relationship between Argentina's export tax rate and global supply of soybeans. Thus, a 1% change in Argentina's export tax rate will cause the quantity supplied of soybeans in the world market to decline by .079%. Essentially, the export tax positively affects U.S production and helps create jobs in the United States.

CHAPTER 1

Introduction

In 2008, a riot of farmers in Buenos Aires, Argentina grew hostile after what was presumed to be unfair governmental control. This government regulation existed in the form of an increase in the export tax rate on primary commodities such as soybeans, sunflower, wheat, and maize (Kennedy, 2009). Led by the Argentine Rural Society, Argentine Agrarian Federation, the Confederation of Argentine Rural Societies, and the Inter-cooperative Association, Argentinean farmers refused to pay higher export taxes which led to a shortage of supply in the world soybean market. The lack of supply of soybeans in the global market inevitably inflated the world price of soybeans and soybean derivatives (soy meal and oil). Beginning in 1982, the Government of Argentina (G.O.A) imposed an 18% tax rate on all export commodities (Bolling, Dohlman, & Schnepf, 2001). In 2007 during President Christina Kirchner's first year in office, Argentina increased the export tax rate on soybeans to 27.5% and then 35% during the same period. Six months after Argentina introduced the 35% tax rate, Kirchner levied the export tax rate on soybeans to 44.1% in March of 2008. Farmers in Argentina were not receptive to the 44.1% tax rate and they showed their lack of acceptance by rioting and reducing the quantities of soybeans exported to the world. Argentina ranks third globally in total soybean exports and is considered a large contributor to the global soybean market.

With the third largest market share in the global soybean market, Argentina's quantity supplied of soybeans can significantly influence the world price of soybeans.

Factors that influence supply such as tariffs, export taxes, subsidies, technology, input cost, and other trade barriers will cause shifts in the global market supply curve for soybeans. Along with Argentina's large market share and comparative advantage, the 2007 and 2008 changes in the export tax rate by Argentina had some influence on the world price of soybeans. The average world price of soybeans for 2007 was $218.10 per ton, yet in 2008 the world price of soybeans was $280 per ton, respectively (FAO STAT, 2011). Knowing that President Kirchner increased the export tax rate on primary commodities by 60% gives speculation that the inflated world price of soybeans in 2008 resulted from Argentina's change in the domestic export tax rate. Argentina may not have played the primary role in the price increase, but the country's role may have been considerable due to its market share.

Argentina's policy methods of making decisions are correlated with historical political precedents that that country carried out. In the 1950's under President Juan Peron, Argentina implemented economic policy and trade practices that desired to strengthen domestic industrialization and to minimize external dependency for agricultural inputs. This practice became known as Import Substitution Industrialization (ISI). The ISI is utilized to enhance the domestic market by industrializing goods that are normally imported. Furthermore, Schnepf (2001) proclaimed that the purpose of Argentina employing the ISI method was to ultimately stimulate internal growth by reducing foreign debt and monetary dependence and by enhancing Argentina's exchange rate. The results of the ISI policy may have exacerbated Argentina's domestic economy because of the consequential affects it had on the agricultural sector.

Implementing the ISI strategy penalizes the agricultural sector by obligating farmers to purchase overpriced and inefficient domestic inputs. In this case the input sector may not have been perfectly competitive and therefore the product sector will not function properly. Farmers were forced to purchase inputs from domestic producers because Argentina issued quotas and tariffs on imported agricultural inputs. The ability of Argentinean farmer's to maximize profits was distorted assuming that farmers attempt to maximize profits based on the price of the factor hired (Parkin, 2004). Although the ISI model was effective during the 1950's, its influence began to show signs of exhaustion during the 1970's as a result of frolic monetary and fiscal policy decision making. Stiglitz (1987) identifies the principal of comparative advantage and the concept of natural development (closed economy) as two conflicting arguments surrounding the ISI strategy. Comparative advantage emphasizes the need to trade internationally and to allocate productive resources to the goods or services that the country can produce with the lowest opportunity cost. Natural development agrees mostly with the ISI strategy in that the country attempts to shelter industries by restricting international trade and minimizing foreign dependency of goods, services, and money.

Under President Carlos Menem in 1991, Argentina attempted to introduce fiscal policies that favored agricultural production and agricultural investments. The G.O.A carried out these policies by eliminating almost all export taxes on commodities with the exception of a 3.5% tax on unprocessed oilseeds. During this time the Argentinean government wanted to deregulate the private sector in an effort to further open the

economy to international trade. The intrinsic motive for reducing the export tax rate and deregulating the private sector was to open Argentina's economy to international trade.

1.1 Problem Statement

Argentina's economy has consistently faced increasing domestic inflation and growing governmental deficits. These mounting deficit problems served as a catalyst for President Kirchner to issue a progressive export tax rate on primary commodities in order to increase government revenues. Changes in the export tax rate were driven by the Argentina's strategy to support the domestic economy by inhibiting exports of soybeans with the intentions to create surpluses in domestic supply. The welfare economic agenda behind the policy change could have been to increase consumer surplus in Argentina. By imposing an export tax on soybeans, two effects occur simultaneously in the short run. The first effect takes place globally, where the world prices of soybeans rise and the world quantities to fall. The second effect occurs in the domestic economy of Argentina as the internal quantity supplied of soybean increase. In both instances, demand and all other factors that may cause a shift in the global and domestic soybean supply are held constant. One implication of the tax increase is that the domestic producer surplus decreases due to a decline in the internal equilibrium price, which is a result of the excess supply in the domestic economy. Farmers in Argentina export roughly 95% of their soybean supply to the world, so a miniscule reduction in the amount of soybeans exported could have adverse effects on the revenues of Argentinean farmers (Costa,

2008). The negative shift in the world soybean supply curve should cause an increase in soybean exports from major contributors such as the U.S and Brazil.

Argentina's contribution to the world supply of soybeans ranks third in the world with the U.S and Brazil ranking first and second, respectively. In 2007 Argentina contributed 47.4 Million Metric Tons (MMT) which is equivalent to 21% of the total value of world soybean production; in 2008 Argentina's supply declined to 46.2 MMT. During 2008 the president of Argentina, Cristina Kirchner, levied the export tax on primary commodities and Argentina's production of soybeans declined by 2.6% from 2007 to 2008 (FAO, 2010). The imposed tax rate by Argentina created would eventually create a supply shock and have influence on the world price for soybeans which rose from $218.10 to $280.8 per ton between 2007 and 2008 (FAO, 2010).

Because of Argentina's drastic change in its' domestic export tax rate, there was a shortage of soybean supply in the global market and global soybean prices were inflated. To assume that the Argentinean government efficiently redistributes revenues and maximizes consumer and producer welfare without becoming a victim of distortion is questionable. Essentially, the export tax is a barrier to agricultural trade between Argentina and the rest of the world (ROW). In the short run, the export tax should increase Argentina's domestic consumer surplus as the price of domestic soybeans flattens. A decline in the domestic price of soybeans would reduce Argentinean producer surplus and eventually cause Argentinean farmers to produce less for domestic consumption.

1.2 Purpose

The purpose of this research is to evaluate the 2008 supply shock in the global soybean market and to discover the effects that this shock had on global soybean prices. This research will examine the imposition of export taxes on Argentinean farmers and the effects of such shocks on the global soybean market. It is important to remember that the structure of a market influences the conduct of that market which inevitably impacts how the market performs. Structure relates to the inherent nature of the soybean market and the variables that influence the market. Conduct emphasizes how the soybean market behaves and responds to the changes in the variables described in structure. Lastly, performance explains the outcome in the market using empirical evidence. This research will provide empirical results of how the global soybean market behaves when variables in the market are altered.

1.3 Objective

The objectives of this research are twofold: 1) to measure the supply shock of a change in the export tax rate set by the Argentine government, and 2) to simulate hypothetical future changes in the export tax rate and their implications on the world quantities and price of soybeans.

This research attempts to analyze the effects of changes in the export tax rates on Argentinean soybeans and the implications that this change could have on world soybean prices and quantity supplied of soybeans. Also, the manner in which producers and consumers behave and respond to changes in export taxes will be examined. The primary

macroeconomic variable that will be explored is the export tax rate imposed by Argentina. Secondary to the export tax, prices and output will also be analyzed in an effort to complete the two objectives. Chapter two will articulate the events that encouraged Argentina to partake in the international trade of soybeans. Chapter two will also present reviewed literature on supply shocks and the global and domestic welfare implications of such shocks. Chapter three will explain the econometric procedure that will be used to accomplish both objectives mentioned in this section. Chapter four will interpret the results derived from the econometric analysis in order to accomplish objectives 1 and 2. Chapter five will conclude this research using the empirical results to confer the affects that Argentina's change in fiscal policy could have on the United States of America.

CHAPTER 2

Review of Literature

This section will review literature relating to supply shocks and international trade of agricultural commodities. First, literature will be reviewed using recent studies illustrating the imposition of export taxes and their effects on global commodity markets. Text relative to international trade policies will also be discussed in this chapter to understand the implications of export taxes in the global soybean market. Secondly, supply shocks and their effects will be analyzed in this chapter using past supply shock scenarios as well as methods of measuring supply shocks. Lastly, this chapter will provide insight to soybean producers and consumers regarding the welfare implications of these trade policies.

2.1 International Trade

Prior to the 1980's Argentina's soybean production and export strategies were not viable, but there were several international events that encouraged Argentina to participate in the international trade of soybeans. Among these events included the soybean price increase during the 1970's, the increase in soybean consumption in Europe, and the U.S oilseed export embargo of 1973. The U.S embargo of exports in 1973, for example, prohibited the export of soybeans and other commodities in an effort to flatten domestic commodity prices. During the early 1970's, the U.S domestic price per bushel of soybeans reached record highs of $17.34 per bushel (Bolling, Dohlman, & Schnepf D, 2001). The impact of the embargo on the U.S economy resulted in a decline in U.S

commodity prices, while international prices increased sharply. As a result of the United States decision not to export soybeans, Japan's excess demand for soybeans increased forcing Japan to find a new trade partner. The resulting action of Japan needing to find a new supplier of soybeans was that Brazil became the new exporter of soybeans to Japan. Ultimately, Japan's excess demand, driven by the embargo, enticed Argentina to undertake soybean production for international trade purposes.

Yabuki (1996) disagrees with the notion that most countries that depend on primary commodities as a strong source of exports are countries that are underdeveloped and have low average income. Argentina is not an underdeveloped country in terms of per capita income, yet Argentina's economy strongly depends on agriculture as a source of government revenues and individual income. From 2005 to 2008 the economy of Argentina has created an average excess demand for soybeans of 41,965,483.86 metric tons per year (FAO, 2011). Argentina exports about 95% of its total soybean production which equates to 5% of domestic consumption.

Compared to the United States and Brazil, the economy of Argentina is intermediate to the two regarding the role that agriculture has in the macro economy. Agriculture represents 7% of Argentina's GDP while accounting for 2% and 14% of the Unites States and Brazilian economy, correspondingly (Bolling, Dohlman, & Schnepf, 2001). The agricultural sector of Argentina's economy employs roughly 12% of the labor force compared to 3% and 31% of the United States and Brazil, respectively (Bolling, Dohlman, & Schnepf, 2001). Lastly, agriculture represents about 52% of

Argentina's export value and it depicts about 10% and 33.5% of the United States and Brazil economy respectively (Bolling, Dohlman, & Schnepf, 2001).

The decline in international commodity prices and the global recession during the late 1986 forced Argentina into debt in the amount of $69 billion (39% of GDP) and hyperinflation. Argentina's inflated currency could have caused a saturation of domestic supply which lowered domestic prices in the short run and propelled prices upward in the long run as domestic demand picked up internally.

Argentina embraced president Carlos Menem in 1989 as the country's new president. Under the Menem reform during the 1990's, the peso was highly overvalued due to fiscal policies directed to strengthen Argentina's ability to import goods and services. Because agriculture has a major role in the success and financial stability of Argentina's economy, it is important to understand what an overvalued currency could mean for Argentina's economy. An overvalued currency makes it more expensive for foreign countries to import goods from Argentina and goods become cheaper to import into Argentina. Since agricultural products tend to be inelastic in nature, agricultural export profits for Argentina will increase as the currency becomes overvalued; although, Argentina's export quantities of soybeans may decline. In contrast, as Argentina farmers are compelled to increase exports do to a rise in the world price, the global soybean market can become oversaturated causing prices and profits to fall in the long run. Domestic farmers in Argentina are able to maximize profits because the import cost of

inputs becomes cheaper. Holding other things constant, equation (1) displays how the balance of trade for Argentina should decrease as a result of the overvalued currency.

$$B_t = P_x Q_x - e^* P_m Q_m \quad (1)$$

The balance of trade (BOT) is the monetary difference between export value and import value. The BOT is comprised of the price of exports (P_x), the quantity of exports (Q_x), the exchange rate (e^*), the price of imports (P_m), and the quantity of imports (Q_m). Holding prices and quantities constant, overvaluing the currency causes (e^*) to decrease and the BOT would increase.

Thompson (2001) identifies the Ricardian Limits to the Exchange Rate as:

> If the exchange rate is to low exports will cost too much abroad. If the exchange rate is excessively high, then imports will cost too much. There are limits to the exchange rate if two economies are to trade. If the exchange rate goes beyond these limits international trade becomes unprofitable and ceases (p. 57).

2.2 Supply Shocks

Factors of supply, variables, have an intricate role in determining the movement of the aggregate supply curve. In this research, the price of soybeans, the price of corn, technology, the years of 1982 to 1999, and the export tax rate are all factors of the supply in the global soybean market. If these factors are changed, then the supply curve adjusts to these changes in order to readjust equilibrium within the global soybean market. Changes in the exogenous factors (the price of corn, technology, the years of 1982 to 1999, and the export tax rate) will cause the global soybean supply curve to shift. A

supply shock is a change in an exogenous variable resulting in a shift in the supply curve. A positive supply shock refers to a downward shift in the supply curve. As shown in Figure 2.2.1, a positive supply shock causes the equilibrium price to decrease and the equilibrium quantity to increase holding the demand curve constant.

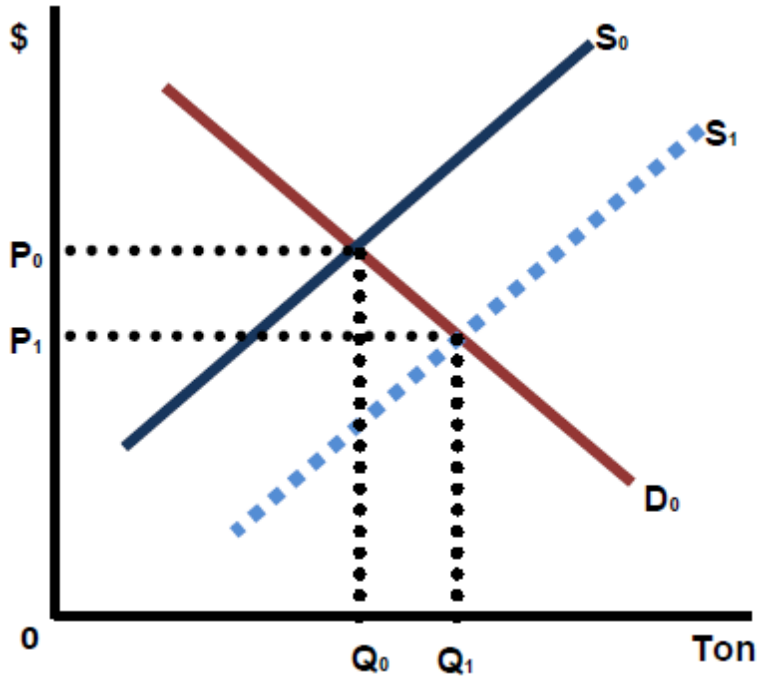

Figure 2.2.1. Positive Supply Shock

Supply shocks are considered negative when a exogenous variable changes and the supply curve shifts upward to the left; the equilibrium price increases and the equilibrium quantity decreases holding the demand curve constant as shown in Figure 2.2.2. In this research, the export tax rate is an exogenous variable. When the export tax

is imposed on domestic producers, the cost of exporting an additional unit of soybean increases; therefore, the export tax rate is directly related to the marginal cost of exporting. When a factor of supply causes the marginal cost of exporting to increase for a given level of output, such changes will cause a negative shift in the supply curve (Froyen T, 2009).

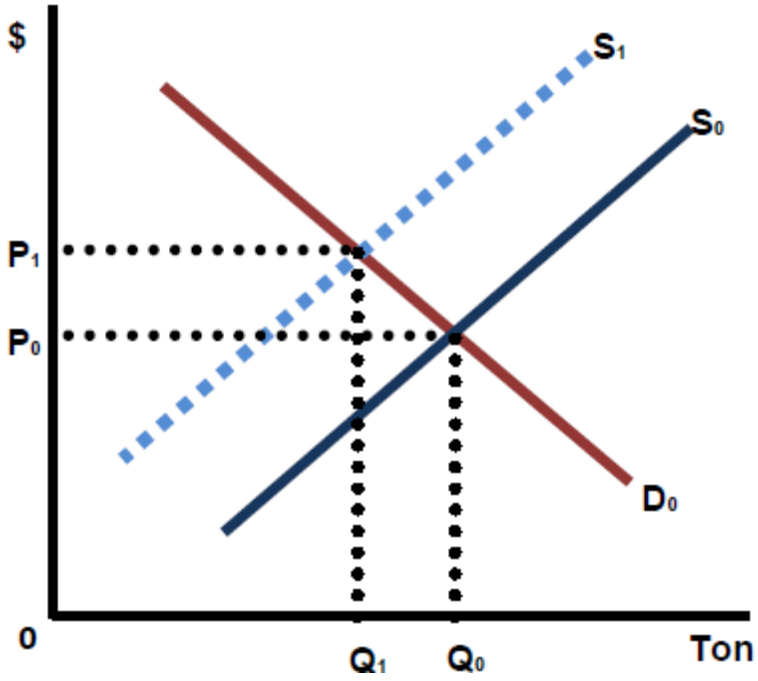

Figure 2.2.2. Negative Supply Shock

The oil crisis of the 1970's is an example of a negative supply shock. During this time period, increases in the world price of inputs, specifically oil, increased significantly. Crude oil can be purchased as an input good where it is not used as a final

product; therefore, crude oil becomes an intermediate good. The drastic increase in the world price of crude oil was due to monopolistic collusion of the Organization of Petroleum Exporting Countries (OPEC) and an oil embargo imposed on the United States. The oil embargo imposed by OPEC against the United States was, in part, attributed to the U.S aid to Israel. As a trade barrier, the embargo acted as an exogenous variable to the aggregate oil supply curve. Froyen (2009) proposes that such "supply shocks" helped explain the U.S economy's inflationary recessions during this time period. During the time of the embargo, the United States roughly imported 25% of the petroleum production. Keynesian economist would explain that because of the 1970's increase in the world price of inputs and raw materials (oil), the production cost for a specific output level of goods that require petroleum would increase; this will lead to a shift in the aggregate supply curve. This increase in raw materials would push domestic prices higher for countries that import large amounts of the raw material. When the price of petroleum increased, consumption of petroleum substitutes increased along with the price of these substitutes. If producers rationally expect the price of inputs to rise, this price expectation would change their production schedule and ultimately cause a shift in the aggregate supply curve.

Wen (2006) explains the oil supply shock of the 1970's to be directly related to macroeconomic performance of the countries that were impacted. Wen (2006) further argued that historical models used to explain the oil shock lacked the multiplier accelerator mechanism. The model interprets the final good sector as being competitive

and the sector for the intermediate good as being monopolistic. If the input sector is monopolistic, does this insinuate that the product sector becomes distorted?

In what ways can we measure supply shocks? Mankiw (1999) proposed an approach to understanding the supply shocks of the 1970's by analyzing the shift in the short run Philips curve and measuring relative price changes. Specifically, Mankiw (1999) investigates how firms responded to inflation derived from the oil shock in 1973. Mankiw (1999) debated that total inflation in an economy is defined by the distribution of relative prices. Mankiw (1999) also illustrated that inflation rise when the relative price distribution is skewed to the right; these same prices decline when skewed to the left.

The statistical analysis used to determine inflation was the interaction between the first and second moments of price changes and the distribution of relative prices. Mankiw's (1999) analysis provides insight on how firms respond to shocks by adjusting to inflation in the input sector (oil). The results of the analysis done by Mankiw (1999) showed that firms are more responsive to large shocks than small shocks. When the price of an input in time period (t) has a greater deviation from the mean price of that input, then this price during period (t) is considered a large shock. Additionally, larger shocks have asymmetric impacts on prices in the short run. Therefore, the inflated world price of soybeans in 2008 can be considered the result of a large shock because Argentina changed the tax rate from 27.5% in 2007 to 44.1% in 2008. This 63% increase in the export tax on Argentinean soybeans was a factor that supported the 28% increase in the world price of soybeans from 2007 to 2008.

2.3 Economic Welfare

Economic welfare is the economic benefit that consumers and producers receive while they consume and sell goods and services. For consumers, the economic welfare is defined by the consumer surplus. Consumer surplus can be defined as the area under the demand curve and above the equilibrium price. For producers, the welfare is represented by the producer surplus. Producer surplus is the area to the left of the supply curve and below the equilibrium price. Consumer and producer surplus is shown in Figure 2.3.

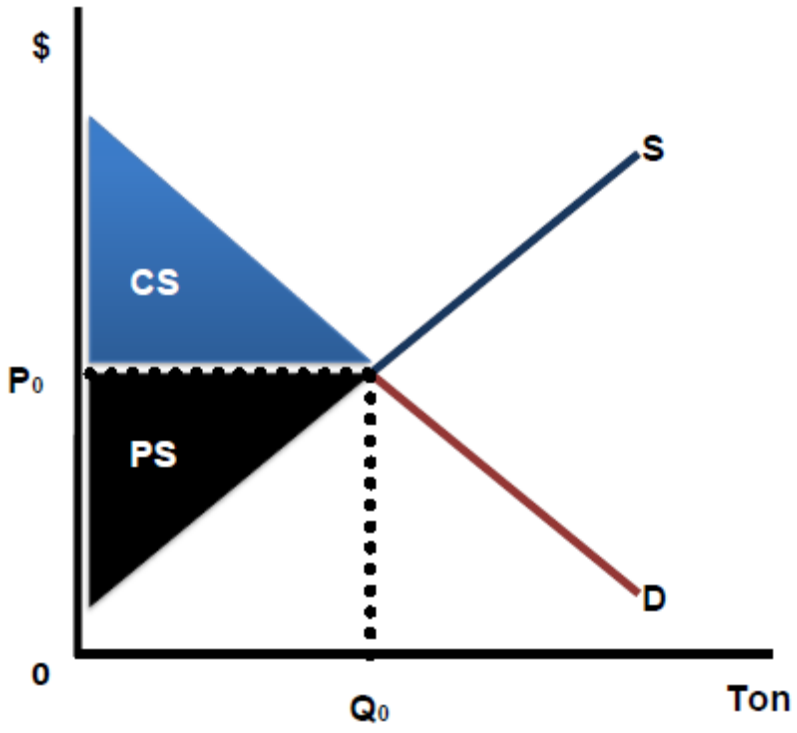

Figure 2.3. Producer and Consumer Surplus

Dowd (2006) models global supply and demand for soybeans in a partial equilibrium framework to determine the welfare enhancing tax level for Argentina soybeans. Dowd's justification for using the partial equilibrium model is because of the assumption that the Argentina government is not efficient in its revenue redistribution strategies. One of the flaws to the partial equilibrium (PE) model is that it ignores other markets and isolates a single market of focus, yet the PE is useful for simple analytical simulations. The PE framework is helpful in estimating the consumer and producer surplus. For producers, the producer surplus (PS) in perfect competition is the area to the left of the supply curve and below the equilibrium price.

In the case of Dowd (2006), simultaneous equations use econometric analyses to estimate equations in the presence of a jointly determined variable. This jointly determined variable is also considered endogenous and statistically it is correlated with the error term in the model (Lim C, Hill C, & Griffiths E, 2008). In the supply and demand model, the equilibrium price and quantity is jointly determined by the market supply and demand. Simultaneous equations consist of structural equations and reduced form equations. The structural equation highlights the economic theory behind the endogenous variables and it is the equation used to explain the behavior of problem. The reduced form equation expresses an endogenous variable as a function of the instrumental variables; the structural equation depends on the predicted outcomes of the response (endogenous) variable. The Dowd (2006) study concludes by comparing the estimated optimal welfare enhancing export tax rate of 25.29% to the actual rate established by the Argentina. Dowd (2006) transforms the data into natural logs for the purpose of

estimating supply and demand elasticity's. The elasticity's represent the global producer and consumer responsiveness to price changes. When a good is inelastic, which most agricultural products tend to be, the percentage change in the price of the commodity will induce a smaller change in the quantity demanded for that commodity. In addition, the effects of exogenous variables to surplus distributions can be closely evaluated by identifying an optimal welfare enhancing tax rate for Argentina. In this research, utilizing the 2008 Argentinean export tax as a factor that causes a supply shock in the global soybean market will allow implications to be drawn for other competing countries unlike the study done by Dowd (2006). Dowd (2006) also uses data from 1965, yet Argentina did not begin exporting soybeans until 1982 which is accounted for in this study.

A model used to capture multiple markets simultaneously is the general equilibrium model. Yilmaze (1996) acknowledged the limitations of the PE model recognizing that in any economy a single market does not exhaustively determine the performance of the aggregate economy. Therefore, broader economic analysis should be taken into consideration and multiple simultaneous equations should be used. An assumption behind the GE model is that the government is welfare maximizing and that it redistributes revenues efficiently and effectively. Although the GE is a more preferred framework for evaluating supply and demand in an economy, PE provides a less complex structure in which estimates can be generated.

CHAPTER 3

Methodology

Chapter 3 will discuss the methods used to explain supply shocks in the global soybean market. The first objective is to develop supply and demand equations so that supply shocks can be measured as noted in the introduction. In accord with the second objective mentioned in the introduction, the goal of this section is to methodically formulate a simulation to predict outcomes in the global soybean market resulting from changes in the Argentinean export tax rate. Data, variables, assumptions, hypothesis testing, and the econometric problem used in the method of explain supply shocks will be explained.

3.1 Data

In an effort to evaluate supply shocks on the world soybeans market, secondary data were obtained from the USDA National Agricultural Statistical Service (NASS), Food and Agriculture Organization of the United Nations (FAO), and the Penn World Table (PWT). The interval from which data was collected was 1982 to 2007. Quantities supplied are determined by the summation of the annual exports from the top ten exporting and consuming countries. Quantities demanded are determined by the summation the summation of the annual imports from the top ten exporting and consuming countries. The own and cross price data were extracted from NASS and the units are in U.S dollars per bushel. The tax variable represents the export tax rate that Argentina imposed on its domestic producers from 1982 to 2007; the units are in

decimals. The trend variable renders the technology (equipment, fertilizer, and other factors of production) and explains the change in production that results from a change in the technology of these factors. Novice is a dummy variable representing the years between 1982 and 1999. During this time period, Argentina was a small player in the soybean export market and the country was in the beginning stages of producing and exporting soybeans. Real gross domestic product is the dollar amount of all the goods and services produced annually per capita for all ten countries; this data was obtained from the PWT.

3.2 Assumptions

There are five economic assumptions used in this research to help explain supply shocks. The first economic assumption is that demand in the soybean market is held constant. Therefore, in the PE concept only the supply curve will change as a result of the shock. The second assumption is that the changes in trade policies and their affects are normally distributed over time. Thirdly, it is assumed that the weather patterns in the world market of soybeans are stationary over time. The fourth assumption is that domestic and global producers are not able to adjust to the tax change in the short run and ultimately they do not rationally expect the supply shock. Lastly, firms in the soybean market are price takers.

Complimenting the economic assumptions are the model assumptions. The two stage least squares procedure theoretically violates the least squares assumption stating that the error term and the explanatory variable must be uncorrelated with each other

(Studenmund, 2006). The necessary condition for the violation of this assumption is that there be a jointly determined endogenous variable. In the global market of supply and demand, the price of soybeans is jointly determined by the quantities supplied and demanded for soybeans. The endogenous price variable is correlated with the error term. In an effort to combat the issue of correlation, instrumental variables are used to estimate the soybean price in a reduced form equation. Both models are corrected for heteroskedasticity using Whites Robust Errors (White, 1980). The instrumental variables used in the model are real gross domestic product, price of corn, novice, tax, lag price of soybeans, and technology. The purpose of the instrumental variables is to create a new endogenous variable that is not correlated with the error term. This new endogenous variable becomes a proxy variable for the original endogenous variable after it is regressed on the instrumental variables. These instrumental variables are correlated with the endogenous variable but uncorrelated with the error term in the structural model. In this research, the price of soybeans is regressed on the instrumental variables and this creates the proxy variable.

3.3 Hypothesis Testing

The hypothesis to be tested in this research is that the tax and novice variable in the supply equation are insignificant in explaining the world quantity of soybeans supplied. An F-test will be used to test the null and alternative hypothesis: H_0: $\beta_{Tax} = \beta_{Novice} = 0$, and H_a: Not H_0 to compare the restricted verses the full model. When the

tax rate and novice variables are excluded the model for the null hypothesis resembles equation (2) and is considered the restricted model.

$$\mathrm{Ln}(\mathrm{Supply}_t) = \beta_0 + \beta_1 \mathrm{Ln}(\mathrm{Psoy}_t) + \beta_2 \mathrm{Ln}(\mathrm{Pcorn}_t) + \beta_3 (\mathrm{Tech}_t) + \mu \quad (2)$$

The full model includes the tax rate and the novice variables as depicted in equation (3).

$$\mathrm{Ln}(\mathrm{Supply}_t) = \beta_0 + \beta_1 \mathrm{Ln}(\mathrm{Psoy}_t) + \beta_2 \mathrm{Ln}(\mathrm{Pcorn}_t) + \beta_3 (\mathrm{Tech}_t) + \beta_4 (\mathrm{Novice}_t) + \beta_5 \mathrm{Ln}(\mathrm{Tax}_t) + \mu \quad (3)$$

The results are accessed to determine the true statistical significance of including the tax and novice variables into the model. The restricted equation compared to the full equation will be the method of determining the significance of including the tax and novice variable. Equation (4) reflects the F-test used to compare the restricted verses the full model.

$$F = \frac{(\mathrm{ESS_r} - \mathrm{ESS_f})/J}{(\mathrm{ESS_f})/(N-K)} \quad (4)$$

The ESS is the error sum of squares, r is interpreted as restricted, f is full, J and (N-K) corresponds to the degrees of freedom or things free to vary.

3.4 Econometric Problem

Simultaneous equations are used to develop supply and demand equations for the global soybean market. The variables used in the simultaneous equations to help explain global quantity supplied and demanded for soybeans are: the price of soybeans (Psoy), the price of corn (Pcorn), export taxes (Tax), the technology (Tech), a dummy variable

(novice), and real gross domestic product (Rgdp). The structural equations used in this research are shown in equations (5) and (6).

$$\mathrm{Ln}(\mathrm{Supply}_t) = \beta_0 + \beta_1 \mathrm{Ln}(\mathrm{Psoy}_t) + \beta_2 \mathrm{Ln}(\mathrm{Pcorn}_t) + \beta_3 (\mathrm{Tech}_t) + \beta_4 (\mathrm{Novice}_t) + \beta_5 \mathrm{Ln}(\mathrm{Tax}_t) + \mu \quad (5)$$

$$\mathrm{Ln}(\mathrm{Demand}_t) = \alpha_0 + \alpha_1 \mathrm{Ln}(\mathrm{Psoy}_t) + \alpha_2 \mathrm{Ln}(\mathrm{Rgdp}_t) \quad (6)$$

Equation (5) represents the world quantity supplied of soybeans and equation (6) is the world quantity demanded for soybeans. The reduced form equations used in this research are displayed in equations (7) and (8).

$$\mathrm{Ln}(\mathrm{Psoy}_t) = \delta_0 + \delta_1 \mathrm{Ln}(\mathrm{Pcorn}_t) + \delta_2 \mathrm{Ln}(\mathrm{Psoy}_{t-1}) + \delta_3 (\mathrm{Tech}_t) + \delta_4 \mathrm{Ln}(\mathrm{Tax}_t) \quad (7)$$

$$\mathrm{Ln}(\mathrm{Psoy}_t) = \lambda_0 + \lambda_1 \mathrm{Ln}(\mathrm{Pcorn}_t) + \lambda_2 \mathrm{Ln}(\mathrm{Psoy}_{t-1}) + \lambda_3 \mathrm{Ln}(\mathrm{Rgdp}_t) \quad (8)$$

Equation (7) is the reduced form equation for world quantity supplied and equation (8) is the reduced form equation for world quantity demanded for soybeans. In the reduced form equation for world supply, the endogenous soybean price is regressed on the price of corn, the lag price of soybeans, technology, and a tax variable. In the reduced form equation for world demand the endogenous soybean price is regressed on the price of corn, the lag price of soybeans, and real gross domestic product. Gamma (δ) and lambda (λ) are used to imply that the equations are for the reduced form. Gamma is used for the supply equation lambda is used for the demand equation.

3.5 Simulation of the Supply Shock and Welfare

This section discusses how to achieve the second objective and the method used to estimate the consumer and producer surplus. After developing the supply and demand equations as mentioned in section 3.4, the first step requires that the tax elasticity of supply be calculated (ε_s). This elasticity explains the responsiveness of quantity supplied of soybeans to the export tax rate. Mathematically the elasticity can be calculated using equation (9).

$$\varepsilon_s = \frac{\partial Q_s}{\partial Tax} \times \frac{\bar{\bar{T}}}{\bar{Q}} \tag{9}$$

By transforming the tax variable into the natural log, the coefficient of the tax variable in the supply equation is the elasticity. The tax elasticity of supply is interpreted as a one percent change in the export tax will yield a (x%) change in the quantity supplied of soybeans; where (x) is any number greater than zero.

The next step in the simulation is to adjust the new equilibrium price ($Psoy_1$) to the change in the export tax rate. This adjustment takes place by setting the supply and demand equations equal to each other and solving for the price of soybeans. Once the equilibrium price ($Psoy_1$) is estimated, the equilibrium quantity can be estimated as well. This new equilibrium price is compared to the original equilibrium price ($Psoy_0$) in order to determine the percentage change in the price of soybeans; the calculation for this change is represented in equation (10).

$$\frac{(Psoy_1 - Psoy_0)}{(Psoy_1 + Psoy_0)/2} \tag{10}$$

Thus, the supply shock is measured by this percentage change in the equilibrium price and quantity.

The last step in the simulation is to calculate the consumer and producer surplus resulting from the change in the equilibrium price. The consumer surplus represents the benefit that consumers are able to receive by purchasing a good at a price that is lower than the highest price the consumer would be willing to pay. The producer surplus is the benefit that producers achieve by selling a good at a market price that is higher than the least market price they would be willing to sell the product for. Using the intercept from the supply and demand equations, the equilibrium price and quantity, the area for consumer and producer surplus can be formed by calculating the area of the surplus triangles. By finding the area of the CS triangle in Figure 3.5, the total consumer surplus can be calculated to better understand the consumer welfare in the global soybean market that results from a change in the export tax rate in Argentina. This same calculation can be done to estimate the producer surplus in the global soybean market. A method of calculating the change in consumer surplus is shown in equation (11) (Weimer, 2001, p. 52).

$$\Delta CS = \Delta P(Q_0) + \frac{1}{2}\left[\left(\frac{\Delta Q}{\Delta P}\right)\left(\frac{P_0}{Q_0}\right)\right]\left[(\Delta P)(Q_0)\left(\frac{\Delta P}{P_0}\right)\right] \quad (11)$$

$$= \Delta P(Q_0) + \frac{1}{2}[\varepsilon_d]\left[(\Delta P)(Q_0)\left(\frac{\Delta P}{P_0}\right)\right] \quad (12)$$

$$= \Delta P(Q_0)\left[1 + \frac{1}{2}\left(\frac{\Delta P}{P_0}\right)\varepsilon_d\right] \quad (13)$$

The change in producer surplus can be found by calculating the difference between triangle $0P_1A_1Q_1$ and $0P_0A_0Q_0$ in Figure 3.5.

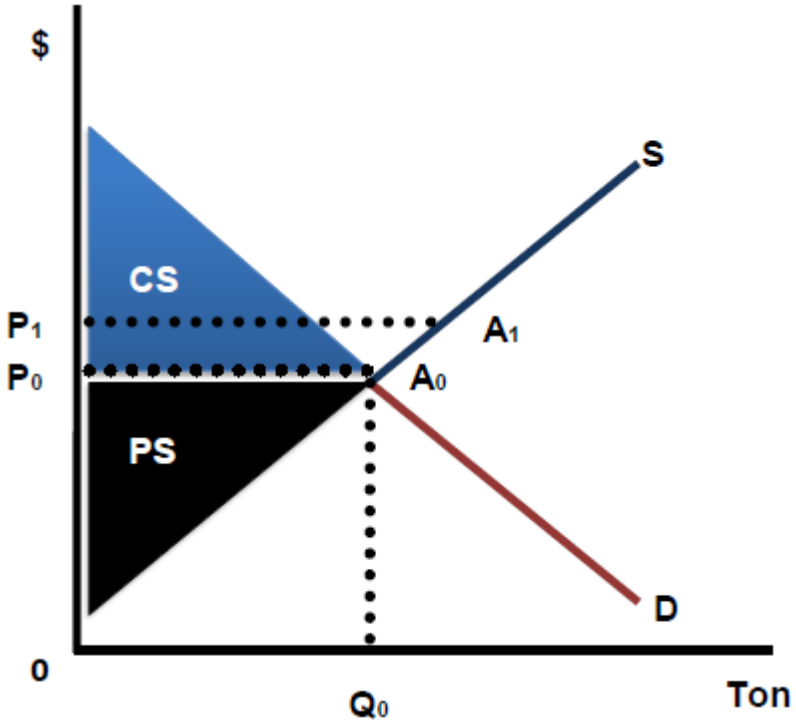

Figure 3.5. Surplus Calculation

What would happen in the world soybean market if soybean exports from Argentina declined? How will consumers and producers in the global market be affected by this change in soybean exports? The simulation should help generate an understanding to these questions. A hypothetical export tax change will be implemented into the supply equation beginning with a 2% change in the export tax rate and ending with a 63% change in the export tax rate.

CHAPTER 4

Data Analysis and Results

4.1 Theoretical Application

In this chapter, the data analysis and results are presented first for the supply equation using simultaneous equations, which are shown in Table 4.1.1 and Table 4.1.2. The estimates of the reduced form equation of world soybean supply are given in Table 4.1.1. The estimates are used to predict the proxy price variable in the world market for stage two of the analysis. The economic significance of the lagged price of soybeans is that in agriculture, the previous year's prices help establish a baseline of prices for the current year. In essence, current prices are a function of last year's prices; but not limited to last year's prices only. The reduced form's F-statistic (64.35) suggests that the data fits the model and that the overall probability of making a type-one error is small (2.08e-13). The Adjusted R-squared confirms that 89% of the variation in the price of soybeans can be explained by the instrumental variables. The price of corn is the only variable that is statistically significant with a p-value of 4.49e-7. The p-value for the price of corn implies that the relationship between the price of soybeans and the price of corn is not by chance. The second stage of the supply simultaneous equations process estimates the variables that help explain quantity supplied in the global soybean market. Table 4.1.2 displays the outcome for the second stage for the simultaneous equations.

Table 4.1.1. Reduced Form Equation for World Soybean Supply

	Estimate	Std. Error	t-value	p-value
Intercept	3.314403	5.168235	.0641	.527
Price Soy (t-1)	.181318	.014354	1.263	.217
Price Corn	.38892	.058976	6.595	4.49e-7
Technology	-.00139	.002561	-.541	.593
Tax	-.01405	.034267	-.41	.685
Res.SE(.05804)	Mult R^2 (.9051)	Adj R^2 (.891)	F-stat (64.35)	Pval (2.08e-3)

Table 4.1.2. Stage Two Estimates for World Soybean Supply

	Estimate	Std. Error	t-value	p-value
Intercept	-183.836	35.14235	-5.231	1.83e-5
Price Soy	2.2934	2.26935	1.011	.322
Price Corn	-.93329	.95177	-.981	.336
Technology	.09631	.01737	5.545	8.03e-6
Novice	-.34806	.06927	-5.025	3.15e-5
Tax	-.07868	.11604	-.678	.504
Res.SE .1862)	Mult R^2 (.9478)	Adj R^2 (.9377)	F-stat (94.36)	Pval (8.08e-6)

The a priori expectations regarding the relationship between the independent variables and dependent variable are in agreement. The positive relationship between the own price and quantity supplied is in accord with the concept that producers want to

supply more of a good as the price of the good increases. It is important to remember that producers and consumers are at odds with each other; producers want to supply more as the price of a good or service increases, and consumers want to consume more as the price of a good or service declines. The own price elasticity of supply estimates that a 1% increase in the price of soybeans will yield a 2.29% increase in the quantity of soybean exported per bushel holding all other factors that influence supply constant. There is an inverse relationship between the cross price of corn and exports, implying that if the price of corn increases then farmers will produce less of this product and more soybeans. The price elasticity of the substitute corn estimates that a 1% change in the price of corn will yield a .933% change in the quantity supplied of soybeans in the opposite direction holding all other factors that influence supply constant at their mean values. The technology variable is statistically significant at the (α) .001 level. Alpha (α) is the probability of rejecting a true null hypothesis (type-one error). The connotation behind the positive trend variable is that as time increases, technology will increase accordingly to enhance the production capacity for farmers. The dummy variable novice is also statistically significant at the (α) .001 level of significance and this variable represents the interval from 1988 to 1999 in which supply was below trend and Argentina was considered a novice in exporting soybeans. The tax variable represents the years in which Argentina imposed highly influential export tax rates on soybeans.

The outcome of the simultaneous equations estimates that there is an inverse relationship between Argentina's export tax rate and global supply of soybeans. Thus, a 1% change in Argentina's export tax rate will cause the quantity supplied of soybeans in

the world market to decline by .079%. In 1982 Argentina first introduced export taxes on soybeans and other staple commodities. Argentina eliminated almost all of its export taxes in 1991witht the exception of unprocessed oilseeds. In 2002 the export tax rate went from 10% on soybeans to 23.5% in the same year. Argentina initiated a 27.5% export tax rate on commodities in 2007 and in November the export tax was raised to 35%. Finally, in 2008 the export tax rate was raised to 44.1% in March, only to be reduced to 35% after farmers in Buenos Aires went on strike.

The primary goal of stage one of the demand simultaneous equations analysis is to estimate the proxy price variable for soybean demand in the global soybean market. To avoid violating the assumption mentioned in section 3.5 of this research, it is necessary to create a proxy price variable. Once the proxy price is estimated it will take the place of the own price in the second stage of the simultaneous analysis. The lagged price of soybeans, the price of corn, and real gross domestic product are the variables used to estimate the proxy price variable. Table 4.1.3 displays the reduced form for stage one of the simultaneous equations. The F-statistic of 93.84 suggests that the data gathered to calculate estimates fit the simultaneous equations model. Also, the F-statistic implies that the overall probability of making a type-one error is close to zero (.000102). The Adjusted R-squared estimates that 89% of the variation in the price of soybeans can be explained by the instrumental variables. The residual standard error is the overall variance of the model and it is also known as the means square error.

Table 4.1.3. Reduced Form Equation for World Soybean Demand

	Estimate	Std. Error	t-value	p-value
Intercept	1.34328	.60934	2.204	.0359
Price Soy (-1)	.12202	.13253	.921	.3651
Price Corn	.36961	.05225	7.073	1.08e-7
RGDP	-.06531	.04713	-1.386	.1767
Res.SE(.05563)	Mult R^2 (.9095)	Adj R^2 (.8998)	F-stat (93.84)	Pval (1.02e-4)

Stage two of the demand simultaneous equations process estimates the variables that help explain quantity demanded in the global soybean market. The outcome for the world demand structural equation is given in Table 4.1.4. A priori expectations regarding the relationship between the independent variables and dependent variable are in agreement. The intercept and demand consumption relationship is inverse because of real gross domestic product. The negative relationship between the own price and the demand is in accord with the idea that demanders want to consume more of a good as the price of the good falls. The own price elasticity of demand declares that a 1% increase in the price of soybeans will yield a .12% decrease in the quantity of soybeans demanded per bushel. Consumption of agricultural products is inelastic and therefore the consumption quantities are less responsive to changes in the prices of agricultural products; this is relative to the expenditure share associated with the good. There is a positive relationship between real gross domestic product and the quantity demanded for soybeans because Rgdp is a reflection of income. Real gross domestic product is

statistically significant to the (α) .001. The real gross domestic product elasticity of the demand for soybeans states that a 1% change in the price of soybeans will yield a .97% change in the quantity demanded of soybeans in the same direction.

Table 4.1.4. Stage Two Equation for World Soybean Demand

	Estimate	**Std. Error**	**t-value**	**p-value**
Intercept	-.0056	1.2502	-.004	.996
Price Soy	-.12082	.2739	-.441	.662
RGDP	.97315	.09434	10.315	3.25e-11
Res.SE .1223)	Mult R^2 (.9452)	Adj R^2 (.9415)	F-stat (250.2)	Pval (2.2e-16)

4.2 Supply Shock

A supply shock is any exogenous change in supply (factors other than the own price) that cause a shift in the supply curve. This shock is typically a result of a sudden and drastic change in one of these factors of supply. In this study the change in the tax rate represents the catalyst for the supply shock in the world soybean market. It should be understood that there are different types of supply shocks: positive and negative. A positive supply is one characterize by a downward shift in the supply curve decreasing prices and increase quantity supplied. Negative supply shocks result in a price increase and a decrease in the quantity supplied. Special emphasis is placed on 2008 in which the Argentine government increased the export tax rate from 35% to 44.1. Figure 4.2 shows

the shock effect of a change on the export tax rate initiated by Argentina. The graph shows the shift that takes place when there is a one percent change in the export tax rate. As a result of the tax change the price goes from $204.87/ton to $215.36/ton and the quantity supplied goes from 55,826,000 metric tons to 54,176,000 metric tons. In 2007 the export tax rate in Argentina was 27% and six months later the rate was increased to 44.1% for staples commodities. In less than one year there was a 63% change in the export tax rate in Argentina. Using the tax elasticity of supply of .07 for a 1% change in the export tax rate, the magnitude of this 63% change is a 4% change in the quantity supplied of soybeans. During this same interval (2007 to 2008) the price per ton of soybeans increased by 28.7% (FAO, 2010).

4.3 Simulation

This section facilitates the tax simulation in order to complete the second objective mentioned in section 1.4 of this research. The export tax rate set by Argentina is changed by a given percent to simulate some hypothetical situations. Once the tax is changed, the supply curve shifts and a new equilibrium world price is calculated to show the effects of a change in the export tax rate in the global soybean market. This shift is represented in Figure 4.3. Figure 4.3 depicts the graphical outcome of a change in Argentina's export tax rate and the influence that this modification could have on the global soybean market.

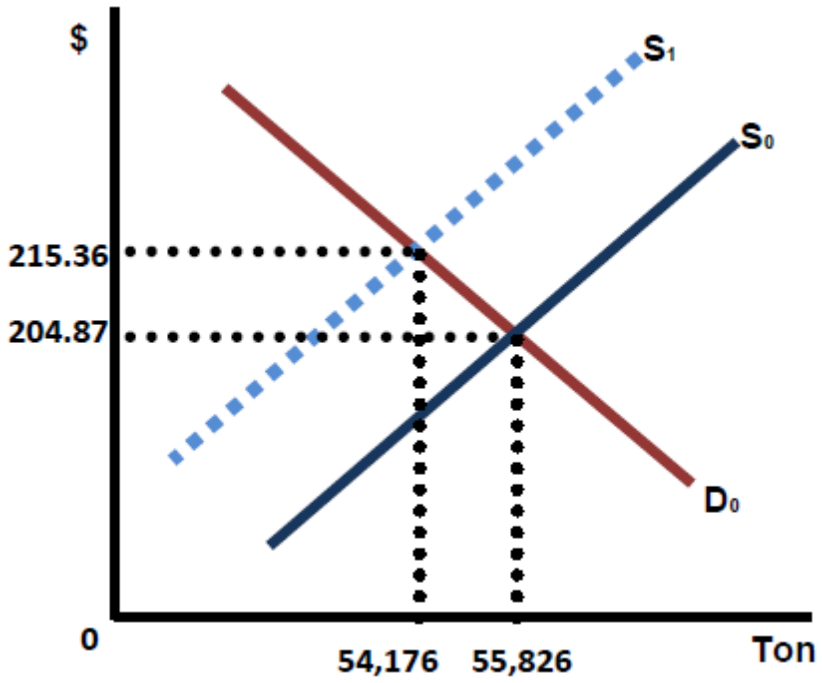

Figure 4.3. Estimated Supply Shock

Equating the estimated demand and supply equations to each other and solving for the equilibrium price is how the initial equilibrium price is derived. Simulated percentage changes in the export tax rate were conducted. The new percentage change was calculated into the estimated quantity supplied equation in order to find the new equilibrium price. Table 4.3.1 shows the simulated effects that a change in the export tax will have on world soybean prices, ceteris paribus. Between 0% and 25% changes in the export tax rate there seems to be little progressive changes in the equilibrium price of soybeans. Changes in the export tax rate between 26% and 60% produce the most significant percentage change in the equilibrium world price of soybeans. The change in

the export tax rate from 27.1% to 44.1% between 2007 and 2008 was a 60.6 percentage point change in the tax rate. Based on the simulation, a 60 percentage point change in the tax rate should yield a 29.5% change in the equilibrium price which is close to the 28% change in the equilibrium price of soybeans per metric ton between 2007 and 2008. Because Argentina is a large nation in soybean exports, significant changes in the amount of soybeans the country exports will have noticeable influences on the world price of soybeans.

Table 4.3.1. Changes in Tax and Equilibrium Price

ΔTax	**ΔPrice**	**ΔTax**	**ΔPrice**
2%	9%	**13%**	13%
3%	10%	**14%**	13%
4%	10%	**15%**	14%
5%	10%	**16%**	14%
6%	11%	**17%**	14%
7%	11%	**18%**	15%
8%	11%	**19%**	15%
9%	12%	**20%**	15%
10%	12%	**25%**	17%
11%	12%	**45%**	24%
12%	13%	**63%**	30%

Table 4.3.2 shows the simulated effects that a change in the export tax will have on world quantity supplied, ceteris paribus. The inverse relationship between quantity supplied and export taxes agrees with a priori expectations between the two. The graph explains the relationship between Argentina exports and the export tax rate. As the tax increase, Argentina farmers are less willing to export soybeans to the world. At a certain

quantity, the restricted amount of soybean exports by Argentina farmers begins to have cumbersome effects on the world supply of soybeans. A shortage is created in the world soybean supply and this will encourage the U.S and Brazil to increase their exports of soybeans to the world. The producer surplus for soybean exporters increases with the increase in the world price. With the first 25% changes in the tax rate the quantity supplied of soybeans decline lethargically. When the export tax rate is between 30% and 60%, the quantity supplied of soybeans decrease at an increasing rate. It is during these percentage changes in the export tax rate that a shock occurs in the global supply of soybeans. The Producers in want to sell soybeans as the price increase. This happens because the producer surplus increases with the increase in prices. Because the equilibrium price and quantity is determined at the intersection of supply and demand, consumers willingness to pay decreases as the price of soybeans increase.

Table 4.3.2. Changes in Tax and Equilibrium Quantity

ΔTax	**ΔQuantity Supplied**	**ΔTax**	**ΔQuantity Supplied**
2%	-.03957%	**13%**	-.47489%
3%	-.07915%	**14%**	-.51477%
4%	-.11872%	**15%**	-.55404%
5%	-.1583%	**16%**	-.59363%
6%	-.19787%	**17%**	-.63319%
7%	-.23745%	**18%**	-.67277%
8%	-.27792%	**19%**	-.71234%
9%	-.3166%	**20%**	-.75192%
10%	-.35617%	**25%**	-.94979%
11%	-.39575	**45%**	-1.74%
12%	-.43532%	**63%**	-2.45%

4.4 Economic Significance and Welfare Analysis

The results from the econometric analysis showed that there is an inverse relationship between the export tax rate and quantity supplied of soybeans. Because of the negative supply shock, the global consumer surplus in the soybean market will decline as the equilibrium price for soybeans increase. Simultaneously, the producer surplus will increase in the global soybean market as the price of soybeans increase. Using the calculations mentioned in section 3.5, the estimated total consumer surplus changes by -594,265 units and the total producer surplus changes by 78,602 units. The -594,265 change in the total consumer surplus implies that the consumer's economic benefit from soybean consumption declines as the world price of soybeans increase. The change in total producer surplus suggest that as the world price of soybeans increase, soybean producers benefit economically as these producers sell soybeans at a market price higher than the minimum market selling price.

Because the United States is the largest exporter of soybeans and demand is inelastic to price changes, revenues for U.S soybeans producers will increase as a result of the price increase. Furthermore, the agricultural input sector of the U.S will benefit because as farm production increase so should the demand for the inputs to produce. Because soybeans are an intermediate good, global welfare should decrease for firms that use soybeans as an input (Heinz ketchup) when the world price of soybeans increase. Brazil may also attempt to fill the deficiency of exports in the global market in an effort to increase its market share of soybean exports. Every country that exports soybeans

should have an incentive to increase its' market share of soybean exports in the global soybean market.

4.5 Hypothesis Testing

The hypothesis tested in this study is that the tax and novice variable in the supply equation is insignificant in explaining the quantity of soybeans exported by countries. H_0: $\beta_{Tax}, \beta_{novice} = 0$, and the alternative hypothesis, H_a: Not H_0, to compare the restricted vs. the full model. Since the F-test statistic ($F_t = 8.45$) is greater than the F-critical value ($F_{c,\alpha=.001} = 8.10$), the null hypothesis would be rejected. The hypothesis test elucidates that having imposed an export tax and the years of 1988 to 1999 are significant in explaining the world exports.

$$F = \frac{(1.1891_r - .64416_f)/2}{(.64416)_f/(20)} = 8.45 \quad (17)$$

CHAPTER 5

Conclusion

This research evaluated the 2008 supply shock in the global soybean market by measuring the shift in the global soybean supply curve derived from a change in the export tax rate set by the Argentine government. Secondly, this research evaluated the supply shock by simulating changes in the export tax rate and the implications on the world quantities and price of soybeans. The results from the simultaneous equations showed that an increase in the export tax rate of 63% (from 2007 to 2008), could result in a 4% change in the quantity supplied of soybeans in the global market and a 30% change in the world price of soybeans. The results estimate that the 28% increase in the world price of soybeans from 2007 to 2008 was in part attributed to the increase in Argentina's export tax rate during the same interval.

5.1 Implications

The United States is the largest exporter of soybeans in the world. Because the U.S is a competitor to Argentina in soybean export, it is necessary to understand how these policy changes in Argentina will influence foreign behavior. When Argentina's export declined from 2007 to 2008 as a result of the export tax, there was a shortage in world market of soybeans. With this shortage, the world price of soybeans increased substantially; therefore, the world price increase gives the U.S an incentive to increase its exports of soybeans in the world market. Essentially, the export tax positively affects U.S production and helps create jobs in the United States. As the quantity of soybean

exports increases so does agricultural production; agricultural production is directly related to U.S input sector for agricultural production. Since U.S farmers will need more equipment machinery to export the soybean crop, input suppliers such as John Deere and New Holland could benefit from the increase in the export tax rate. What would happen to U.S companies that sell soybeans as an input ingredient to food producers? For example, the U.S privately owned company Cargill sells processed soybean oil to food producers such as Heinz ketchup. Heinz uses the soybean oil as an input ingredient for its ketchup. Assuming that Heinz aspires to maximize profits and that Cargill competes with other U.S input suppliers, Heinz will purchase the soybean oil from the cheaper input supplier. If the world price of soybeans increase, the domestic price of soybeans could increase because producers desire to export their soybean product to the world market; therefore, a shortage arises in the domestic market and the domestic price increases. Ultimately, the domestic producer surplus will increase for soybean producers in the U.S.

Argentina's $4.8 Billion deficit hinders it from effectively redistributing revenues and subsidizing agricultural production. U.S can use Argentina's export tax as a metric in forecasting soybean production and exports. When Argentina increases the export tax rate, the U.S can anticipate an increase in global excess demand for soybeans and increase its exports to the world market.

The political agreement between Latin American countries is known as the Mercosur agreement. The purpose of the Mercosur is to enhance free trade among Latin American countries by merging enterprises and creating a free trade zone. This free trade

zone imposes a common tariff on goods traded by member states to optimize trade among these countries. The Mercosur union could adversely impact the U.S exporting inputs to Argentina because Argentina will be compelled to trade with the countries a part of the Mecosur union. Between 2002 and 2011 the U.S has exported roughly $178.25 million in fertilizer to Argentina on average (Foreign Trade, 2011). In Argentina, input production grew by 10.5% in January of 2011 (Trading Economics, 2011). Increases in industrialized production could have negative results on the U.S exports of input products to Argentina.

REFERENCES

Anderson, D., Sweeney, D., & Williams, T. (2008). *Statistics For Business And Economics*. Mason: Thomson South Western.

Ash, M., Dohlman, E., & Kelsey, W. (2010, March 9). *Soybeans and Oil Crops*. Retrieved September 8, 2010, from USDA: http://www.ers.usda.gov/Briefing/SoybeansOilcrops/.

Ball, L., & Mankiw, G. (1995). Relative-Price Changes as Aggregate Supply Shocks. *The Quarterly Journal of Economics* , 161-193.

Boardman, A. E., Greenberg, D. H., Vining, A. R., & Weimer, D. L. (2001). *Cost-Benefit Analysis.* Upper Saddle River: Printice Hall.

Bolling, C., Dohlman, E., & and Schnepf D, R. (2001). *Agriculture in Brazil and Argentina: Developments and Prospects for Major Field Crops.* ERS/USDA.

Braga, C. A. (2010). *Econometrics at Illinois.* Retrieved November 10, 2010, from Econometrics at the University of Illinois:ww.econ.uiuc.edu/~facchini/werner/trade/Braga.doc.

Breusch, T. a. (1979). A Simple Test for Heterscedasticity and Random Coefficient. *Econometrica*.

Costa, R. F., Xia, Y., Susanto, D., Rosson, P., & Adcock, F. J. (2008). Retrieved December 6, 2010, from http://purl.umn.edu/45853.

Dowd, W. N. (2009). Export Taxation: The Case of Argentina. Deleware, U.S.

FAO. (2010, October 14). *FAO STAT*. Retrieved November 1, 2010, from The Food and Agriculture Organization of the United Nations: http://faostat.fao.org/site/570/DesktopDefault.aspx?PageID=570#ancor.

Ferris, J. (1998). *Agricultural Prices And Commodity Market Analysis.* WCB/McGraw-Hill.

Foreign Trade.*Foreign Trade*. (2011, March 15). Retrieved April 19, 2011, from U.S Census Bureau: http://www.census.gov/foreign-trade/statistics/product/enduse/exports/c3570.html.

Froyen T, R. (2009). *Macroeconomics Theories and Policies.* Upper Saddle River: Pearson Prentice Hall.

Griffiths, W., & Hill, R. (2008). *Econometrics.* Hoboken: John Wiley & Sons, Inc.

Helmberger, P. G. (1991). *Economic Analysis of Farm Programs.* McGraw-Hill.

Hoffman, L., Elbehri, A., Dohlman, E., & Ash, M. (2001). Global Impacts of Zero-for-zero Trade Policy in the World Oilseed Market: A quantitative Assessment. 1-20.

Kennedy, J. (2009, March). The Argentine Countryside Strike of 2008: the Success of a "Larg Interest Group" and Irish-Argentine Dimension. *Irish Migration Studies in Latin America* , pp. 75-85.

Lim C, G., Hill C, R., & Griffiths E, W. (2008). *Principles of Econometrics.* Hoboken: John Wiley & Sons, Inc.

Mankiw G, N., & Ball, L. (1999). Relative Price Changes as Aggregate Supply Shocks. *The quarterly Journal of Economics* , 161-193.

Parkin, M., & Bade, R. (2004). *Foundations of Economics.* Boston: Pearson Education.

Randall D. Schnepf, E. D. (2001). *Soybean Production Costs and Export Competitiveness In The United States, Brazil and Argentina.* Economic Research Service/USDA.

Stiglitz, J. (1987). *Learning to learn, localized learning and technological progress.* John M. Olin Program for the Study of Economic Organization and Public Policy, Dept. of Economics/Woodrow Wilson School of Public and International Affairs.

Studenmund, A. (2006). *Using Econometrics: a practical guide.* Boston: Pearson Education.

Thompson, H. (2001). *International Economics.* River Edge: World Scientific Publishing Co.

Trading Economics.*Trading Economics*. (2011, June 6). Retrieved June 6, 2011, from tradingeconomics.com: http://www.tradingeconomics.com/.

Wen, L. A.-C. (2006). understanding the Large Negative Impact of Oil Shocks. *Journal of Money, Credit and Banking* , 20.

White, H. (1980). A Heteroskedasticity- Consistent Covariance Matrix Estimator and a Direct Test for Heterskedasticity. *Econometrica* , 817-838.

Yabuki, N., & Akiyama, T. (1996). Is Commodity Dependence Pessimism Justified? *The World Bank International Commodity Policy and Analysis Unit* , 1-56.

Yilmaz, K. (1996). Commodity Exports and Policy. *Koc University Working Paper Series* , 48.